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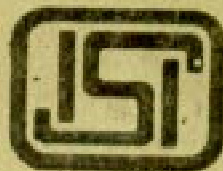


IS : 7095 - 1973

Indian Standard

METHOD FOR VERIFICATION OF KNOOP
HARDNESS TESTING MACHINES

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METHOD FOR VERIFICATION OF KNOOP HARDNESS TESTING MACHINES

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Indian Standard

METHOD FOR VERIFICATION OF KNOOP HARDNESS TESTING MACHINES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 November 1973, after the draft finalized by the Methods of Physical Tests Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 In the preparation of this standard considerable assistance has been derived from ASTM Designation: E 384-69 'Method of test for microhardness of materials', published by the American Society for Testing and Materials.

0.3 In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard prescribes two methods for the verification of Knoop hardness testing machines, namely:

- a) Direct verification, and
- b) Indirect verification by means of standardized blocks.

1.1.1 The direct method is suitable for the initial verification of new machines by the manufacturer and for the verification of rebuilt machines. The indirect method is suitable for machines in service.

1.2 This standard does not specify the procedure used in the routine checking of testing machine by the user.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

*Rules for rounding off numerical values (*revised*).

2.1 Error—The variation in the average hardness value obtained from the stated value of the standardized block, that is:

$$\bar{H} - H$$

where

$$\bar{H} = \frac{H_1 + H_2 + \dots + H_5}{5}$$

[H_1, H_2, \dots, H_5 being the hardness values corresponding to the five indentations (see 3.3.2)], and

H = hardness value of standardized block.

2.2 Repeatability — The greatest variation in the values of the diagonal of the indentations made on a standardized block. If d_1, d_2, \dots, d_5 be the values in scale units of the diagonal of indentation, arranged in increasing order of magnitude, then repeatability will be $d_5 - d_1$.

2.3 Verification — The process of testing an instrument for the purpose of assessing the indication errors.

2.4 Assessment — The assessment is to determine whether an instrument conforms to prescriptions laid down.

3. VERIFICATION

3.1 General — Before verification of Knoop hardness testing machines is carried out, it shall be examined to ensure the following:

- a) The machine is properly set up, and
- b) The load can be applied and removed without shock and vibration which influence the readings.

3.2 Direct Verification — This involves the verification of the load applying mechanism, the indenter and the measuring microscope.

3.2.1 Verification of Load Applying Mechanism — When the load is applied by a lever system with dead weights, the combined accuracy of lever distances and dead weights shall be ± 0.2 percent. When the load is applied directly by dead weights, the weights shall be accurate to ± 0.2 percent.

3.2.2 Verification of the Profile of the Indenter

3.2.2.1 The form of the diamond indenter shall be verified by direct measurement of its shape or by measurement of its projection on a screen.

3.2.2.2 The included angle at the apex of the indenter shall be:

172° 30' \pm 5' on the long axis

130° 0' \pm 5' on the short axis

The offset of any two opposite faces at the apex shall not be more than 1 μ m.

3.2.3 Verification of Measuring Microscope — The measuring microscope shall be calibrated with a micrometer. The error of the micrometer shall not exceed 0.05 mm or 0.5 percent of any interval whichever is greater. The measuring microscope shall be calibrated in the range of its use, and a calibration factor shall be chosen such that the error shall not exceed \pm 0.5 percent.

3.3 Indirect Verification by Means of Standardized Blocks

3.3.1 Indirect verification shall be carried out by means of standardized blocks calibrated in accordance with IS : 7097-1973*.

3.3.2 Five indentations shall be made on the standardized metal block and measured. The tests shall be made in accordance with IS : 6885-1973†.

3.3.3 Verification with standardized test blocks is not recommended if the combination of hardness and test load results in indentations having diagonals less than 20 mm because, under such conditions, the error in the standard micrometer/microscope can represent a significant percentage of the diagonal length. Under these circumstances this method of verification does not offer a reliable means of verifying the equipment.

*Method for calibration of standardized blocks for verification of Knoop hardness testing machines.

†Method for Knoop hardness testing of metals.

4. ASSESSMENT OF VERIFICATION

4.1 Repeatability — The repeatability of the machines to be verified is not considered satisfactory unless it satisfies the following conditions:

*Hardness Range of
Blocks, HK*

*Repeatability of the Machine
Shall be Less Than*

For loads from 1 to < 500 gf:

100 to 250	6 percent of \bar{d}
Over 250 to 650	5 percent of \bar{d}
Over 650	4 percent of \bar{d}

For loads from 500 to 1 000 gf:

100 to 250	5 percent of \bar{d}
Over 250 to 650	4 percent of \bar{d}
Over 650	3 percent of \bar{d}

NOTE — \bar{d} is the average of the values of measured diagonals of indentations.

4.2 Error — The error of the machine to be verified shall not be more than 2 percent of the specified hardness of the standardized block.